

Solubility and Specific Rotation of *l*-Ascorbyl Palmitate and *l*-Ascorbyl Laurate

BY DANIEL SWERN

Renewed interest in *l*-ascorbyl palmitate,² resulting from its recently reported antiscorbutic activity,³ non-toxicity⁴ and commercial availability⁵ has prompted us to determine its solubility at 25° in some typical organic solvents, water, and cottonseed and peanut oils. For purposes of comparison, we also determined the solubility of *l*-ascorbyl laurate² in the two vegetable oils. We have also determined the specific rotation of both *l*-ascorbyl palmitate and laurate. With the exception of water and petroleum naphtha, the temperature coefficient of solubility is high. Benzene and ethyl acetate are two of the best crystallizing solvents for purifying the esters.

Experimental

Solubility Determinations.^a—Solubility in petroleum naphtha, boiling range 63–70°, and water was determined on saturated solutions obtained by shaking the solvent with excess solute until equilibrium, ascertained by analy-

sis, was attained. With all the other solvents, equilibrium was approached from the solution side by allowing excess solute to crystallize. Dissolved ester was determined either by titration with 0.1 *N* sodium hydroxide^a or by evaporation of solvent. At least two determinations were run; precision of duplicates was about five parts per thousand. Solubility of *l*-ascorbyl palmitate in glycerol could not be determined because the solution was a thick gel. Its solubility, however, appeared to be low. Results are summarized in Table I.

Specific Rotation.—Specific rotation was determined with a Bellingham and Stanley Glass Scale polarimeter that could be read directly to 0.01°. A 5–10% solution

TABLE I
SOLUBILITY AT 25 ± 0.10°: *l*-ASCORBYL ESTERS

Solvent	Sol. ^a g./100 g.	Solvent	Sol. ^a g./100 g.
Palmitate		Palmitate	
Water ^b	0.56	Ethyl acetate	4.9
Petroleum naphtha ^c	0.00	Ethyl cellosolve ^c	>33.9
Ethanol 95% ^d	23.5	Peanut oil	0.18
Benzene	0.45	Cottonseed oil	0.22
Ethylene glycol	0.18	Laurate	
1,2-Propylene glycol	6.6	Peanut oil	0.11
Dioxane	19.0	Cottonseed oil	0.08

^a By titration. ^b Solubility by evaporation 0.31 g./100 g. Small and probably variable quantities of solute emulsified, thus accounting for the poor duplication between the results by titration and by evaporation. ^c B. p. range 63–70°. Solubility by evaporation 0.01 g./100. ^d Solubility by evaporation 23.4 g./100. ^e Insufficient material to complete determination.

of the ester in 95% alcohol and a 4.00-dm. tube were employed.

l-Ascorbyl palmitate: $[\alpha]^{25.5D} + 23.3^\circ$ (8.086 g. per 100 ml. of 95% ethanol solution). *l*-Ascorbyl laurate: $[\alpha]^{25.5D} + 26.6^\circ$ (5.014 g. per 100 ml. of 95% ethanol solution).

PHILADELPHIA 18, PENNA.

(1) One of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture. Article not copyrighted.

(2) Swern, Stirton, Turer and Wells, *Oil and Soap*, **20**, 224 (1943).

(3) Ambrose and DeEds, *Arch. Biochem.*, **12**, 375 (1947).

(4) Fitzhugh and Nelson, *Proc. Soc. Exptl. Biol. Med.*, **61**, 195 (1946).

(5) Chas. Pfizer and Company, New York, N. Y.

(6) Daniels, Mathews and Williams, "Experimental Physical Chemistry," McGraw-Hill Book Co., Inc., New York, N. Y., 1929, pp. 111 and 341.